SYLLABUS
Computational Aerodynamics
AAE 512
Spring 2018

Dr. Jonathan Poggie
jpoggie@purdue.edu

Time:	TBD
Room:	TBD
Office Hours:	ARMS 3203 and online, hours TBD
Prerequisities:	Basic numerical methods Basic fluid dynamics, viscous flow, gasdynamics ODEs, PDEs, vector calculus, linear algebra Familiarity with Fortran or C/C++

Objectives:	Become a sophisticated user and developer of CFD codes
	Understand and implement:
	    Finite difference methods
	    Shock capturing / upwind methods
	    Implicit and explicit schemes

Textbook:	R. H. Pletcher, J. C. Tannehill, and D. A. Anderson, Computational Fluid Mechanics and Heat Transfer, 3rd ed., CRC Press, 2013 (Recommended; previous editions may be used)
Suggested References:	W. Cheney and D. Kincaid, Numerical Methods and Computing, Brooks/Cole, 1994. E. Kreyszig, Advanced Engineering Mathematics, J. Wiley, 1999. E. Isaacson and H. B. Keller, Analysis of Numerical Methods, J. Wiley, 1966. G. H. Golub and J. M. Ortega, Scientific Computing and Differential Equations, Academic Press, 1992. J. D. Anderson, Computational Fluid Dynamics, McGraw-Hill, 1995. C. Hirsh, Numerical Computation of Internal and External Flows, Elsevier, 2007. K. A. Hoffmann and S. T. Chiang, Computational Fluid Dynamics, Vols. I-II, Engineering Educational System, Witchita KS, 2000.
Grading:	Midterm & Final 50%, Project 25%, Homework 25%
Homework:	There will be several homework assignments, which will require significant programming in Fortran or C/C++. Homework will be due at the beginning of class on the due date, and must be prepared in a professional manner. Late homework may be penalized. You will be asked to access the Purdue Scholar cluster (https://www.rcac.purdue.edu/compute/scholar/) through Thinlinc (https://thinlinc.rcac.purdue.edu:300/main/).
Project:	Students will prepare a project involving substantial programming. The project will require a short final paper (about 5 pages).
Class Policies:	Students must abide by the Purdue University code of student conduct. All sources and collaborations must be appropriately cited in the project and homework.

Date	Topic	Reading	Homework
Jan. 8 Jan. 10 Jan. 12	Review of ODEs, PDEs, and basic numerics	PTA 2.1-2.6	
Jan. 15 Jan. 17 Jan. 19	**Holiday** Numerical programming	 Class notes	
Jan. 22 Jan. 24 Jan. 26	Finite differences	PTA 3.1-3.3, 3.7	
Jan. 29 Jan. 31 Feb. 2	Wave equation	PTA 4.1	Homework 1 due
Feb. 5 Feb. 7 Feb. 9	Diffusion equation	PTA 4.2	
Feb. 12 Feb. 14 Feb. 16	Laplace's equation	PTA 4.3	
Feb. 19 Feb. 21 Feb. 23	Burgers' equation	PTA 4.4-4.6	Homework 2 due
Feb. 26 Feb. 28 Mar. 2	Review for midterm Midterm (in class)		
Mar. 5 Mar. 7 Mar. 9	Governing equations of fluid dynamics	PTA 5.1, 5.5-5.6	
Mar. 12 Mar. 14 Mar. 16	**Spring Break** **Spring Break** **Spring Break**		
Mar. 19 Mar. 21 Mar. 23	Inviscid problems	PTA 6.1, 6.4-6.6	Homework 3 due
Mar. 26 Mar. 28 Mar. 30	Introduction to parallel programming	Class notes	
Apr. 2 Apr. 4 Apr. 6	Viscous problems	PTA 9.1-9.2	
Apr. 9 Apr. 11 Apr. 13	Mesh generation	PTA 10.1-10.7	Homework 4 due
Apr. 16 Apr. 18 Apr. 20	Advanced viscous problems	Class notes	
Apr. 23 Apr. 25 Apr. 27	Review		Project due
Apr. 30 May 2 May 4	Finals Week Finals Week Finals Week		

PTA: Pletcher, Tannehill, and Anderson, Computational Fluid Mechanics and Heat Transfer, 3rd ed., CRC Press, 2013
Schedule subject to change. Reading assignments should be completed by the day indicated.
Calendar: http://www.purdue.edu/registrar/calendars/2017-18-Academic-Calendar.html